

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
12 August 2004 (12.08.2004)

PCT

(10) International Publication Number
WO 2004/067839 A1

(51) International Patent Classification⁷: D21G 3/00, D21H 23/34

(21) International Application Number:
PCT/FI2004/050006

(22) International Filing Date: 27 January 2004 (27.01.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
20035010 30 January 2003 (30.01.2003) FI

(71) Applicant (for all designated States except US): METSO
PAPER, INC. [FI/FI]; Fabianinkatu 9 A, FI-00130
HELSINKI (FI).

(72) Inventor; and

(75) Inventor/Applicant (for US only): RATA, Ilkka [FI/FI];
Vitsiälänkuja 4, FI-40520 JYVÄSKYLÄ (FI).

(74) Agent: KESPAT OY; P.O.Box 601, FI-40101
JYVÄSKYLÄ (FI).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO,
CR, CU, DM, DZ, EC, EG, ES, GB, GD, GE, GH, GM, HR,
HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ,
NA, NI, NO, NZ, OM, PG, PH, PL, RO, RU, SC, SD, SE,
SG, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,
VC, VN, YU, ZA, ZM, ZW.

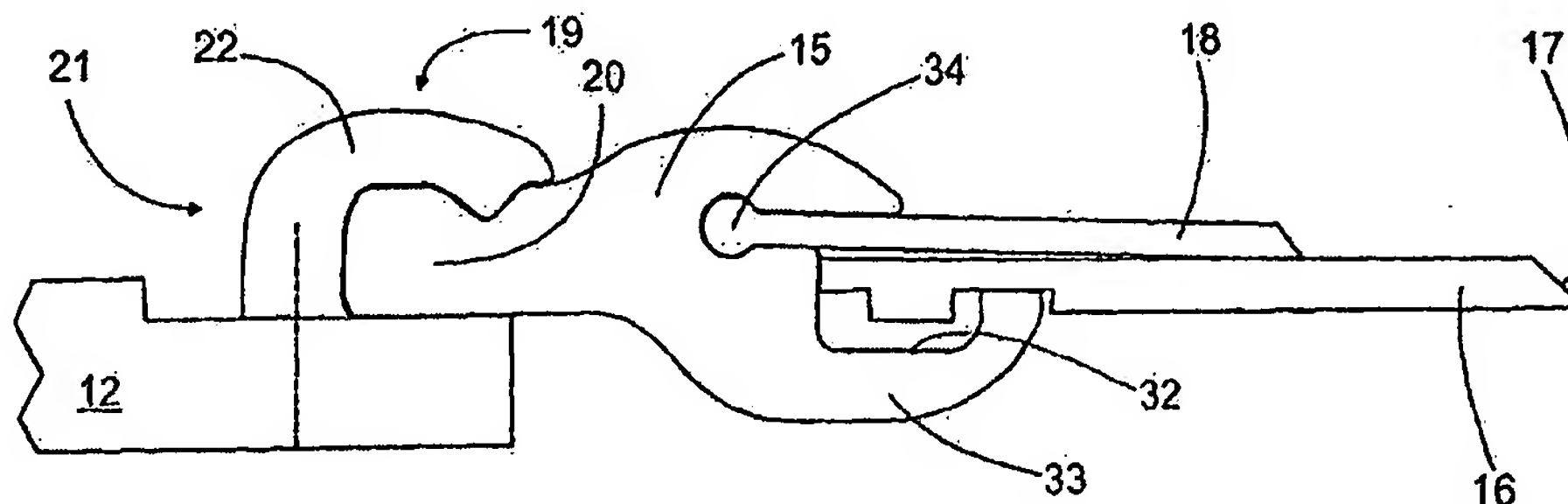
(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), Euro-
pean (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR,
GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: COMPOSITE-CONSTRUCTION TREATMENT EQUIPMENT



(57) Abstract: The invention relates to composite-construction treatment equipment comprising a frame (12) and a blade holder (15) connected thereto and made of a composite material. In addition, the blade holder (15) is provided with a blade (16) and a separate backing blade (18). The blade holder (15) is removably adapted to the frame (12) using a pair of form-locking counter clamps (19). The form-lock is arranged tight in the lateral direction of the blade (16) and essentially free in the axial direction of the blade (16).

WO 2004/067839 A1

Best Available Copy

holes required by the screws in the arm section create discontinuity points in the blade holder construction reducing thus its durability.

5 The object of this invention is to provide novel composite-construction treatment equipment, which is easier to use and service, yet more versatile than heretofore. The features characterizing this invention become evident from the appended claims. In the treatment equipment according to the invention,
10 due to the novel design, the whole blade holder can be changed in a simple manner. This makes the installation and change of the blade holder quick and easy. Irrespective of the unexpected construction, the blade holder can additionally be provided with loading elements, for example. The blade holder can also
15 be easily retrofitted in existing treatment equipment without major modifications. On the other hand, the design of new treatment equipment can be made simpler than before. In addition, with suitable dimensioning and design the components of the treatment equipment can be changed independent of each
20 other, which allows to precisely adjust the treatment equipment characteristics as desired.

The invention is described below in detail by making reference to the enclosed drawings, which illustrate some of the embodi-
25 ments of the invention, in which

- Figure 1 is a side view of the treatment equipment according to the invention arranged in connection with a moving surface,
- 30 Figure 2a is an enlarged view of the blade holder illustrated in Figure 1,
- Figure 2b is a cross-sectional view of a modification of the blade holder shown in Figure 2a without a blade,
- 35 Figures 3a-3d illustrate various applications of the blade holder according to the invention,

treatment is provided by the blade 16 adapted to the blade holder, the dimensioning and material of which can vary between different applications. In the proposed applications both the doctor blade and the coating blade are described. The blade 16 includes a doctoring edge 17, which is arranged in contact with the moving surface 10 by moving the blade holder 15. In this way the moving surface is provided with a treatment. Figure 1 shows a so-called rigid blade holder 15, in which the movement of the blade holder 15 is created by pivoting the beam 13. The proposed blade holders 15 also comprise a separate backing blade 18, which is set in the blade holder 15 by one end. Correspondingly, the other end of the backing blade 18 extends closer to the said edge 17 than the blade holder 15 thus supporting the blade 16. The operation of the backing blade is also described below in greater detail. The blades 16 shown in the figures are new. In a worn blade the edge is to the other direction. On the other hand, a bevel corresponding to a worn blade can in practice be pre-ground to the blade. In Figures 1 and 5a the movement direction of the surface 10 is indicated by the arrow.

According to the invention, the blade holder 15 is unexpectedly removably adapted to the frame 12 using a pair of form-locking counter clamps 19. The form-lock between the counter clamps 20 and 21 is additionally arranged tight in the lateral direction of the blade 16 and essentially free in the longitudinal direction of the blade 16. This allows moving the blade holder in the longitudinal direction of the blade, i.e. in the cross direction of the machine. In practice, for example in a paper machine, the blade holder can be installed simply by pushing from the side and correspondingly, it can be removed by pulling it out. In spite of this quick clamping the form-lock is tight in the lateral direction of the blade. This ensures that the blade holder is reliably kept in place in the machine direction. For additional security during the operation, the cross-machine directional mobility can be prevented using a locking

15. The proposed construction is extremely compact, and the adapter component 22 is easy to attach to the frame 12. In addition, the arm sections of even the known composite-construction blade holders can be modified into shoulder-like counter clamps using suitable machining methods. In practice, however, it is more preferable to bring the blade holder to the final state in connection with the manufacture, thus maintaining an integral blade holder construction. The same reference numbers are used for functionally similar parts.

10 The following embodiments of the adapter component 22 are shown in Figures 3a and 3b. Here one of the counter clamps 20 or 21 is completely formed in the adapter component 22. In this way the adapter component 22 can be permanently attached to the frame 12. In Figure 3a the adapter component 22 is provided with a shoulder-like counter clamp 20 while the groove-like counter clamp 21 is located in the blade holder 15. This ensures that the form-lock is well protected from impurities. In addition, the blade holder 15 can be designed advantageous as regards the manufacture. In the treatment equipment shown in Figure 3a the adapter component 22 has also a curve 23 for compensating the change of the blade 15 position with respect to a conventional blade holder. Due to the adapter component 22 the blade 16 extends closer to the surface 10, in which case the blade angle α of the blade 16 relative to the surface most often changes. According to Figure 1, as the length of the blade holder 15 increases, the blade angle α decreases, which usually has a negative effect on the doctoring result. This problem can be avoided by moving the blade holder in the vertical direction, or it can be at least avoided by adjusting the beam and its position. If required, the adapter component provided with a curve can be installed in the frame also the other way round. The straightness and shape of the curve can also vary between different applications.

provision 25' in more detail. The treatment equipment in question is so adapted that the spring component 27 tends to turn the blade 16 upwards. Correspondingly, the blade 16 can be loaded against the surface by adjusting the pressure in the loading hose 26. The movement of the blade holder 15 is indicated by the arrow in Figure 4a, which shows a solution that is particularly advantageous for new treatment equipment according to the invention. In this case only one loading hose is needed for using the blade holder. For the existing treatment equipment including two loading hoses, a blade holder can be selected, in which there are provisions for two loading hoses (not shown).

Figure 5b shows another embodiment of the loadable blade holder. Here, too, the blade holder 15 movement is provided by means of the loading hose 26. Correspondingly, the returning force is produced by another loading hose 26' or a spring component 27. Here the adapter component 22 extends to both sides of the frame 12. The fastening is secured with screws.

20

The design of the blade holder according to the invention allows using different blades. Figure 3a illustrates a thick plastic blade and Figures 3b-3d show thin metal or composite material blades. Due to the blade holder design, thin blades can be fastened using several different methods. In Figure 3c a conventional rivet 28 is used, whereas in Figure 3b a composite blade has been attached using a special adapter 29. In a similar composite blade shown in Figure 3d there is an extension 30 in the rear part that is larger and different in shape, in which case a separate adapter is not necessary. For the blade 16 the blade holder also has a gap 32, defined, besides the backing blade 18, by the clamp 33.

In the treatment equipment, the function of the backing blade, too, is essential. According to the invention the backing blade 18 is similar to the blade 16. In addition, the end of the

is, the entire treatment equipment is controllably flexible in the cross direction of the machine. This eliminates vibration problems of the treatment equipment and uneven blade wear, among other things. In addition, the known micro-screws designed for profile control are unnecessary. Instead, the major part of reinforced fibers is found in the longitudinal direction of the machine, in which case the treatment equipment can be loaded against the surface. That is, the components are rigid for transferring the force.

10

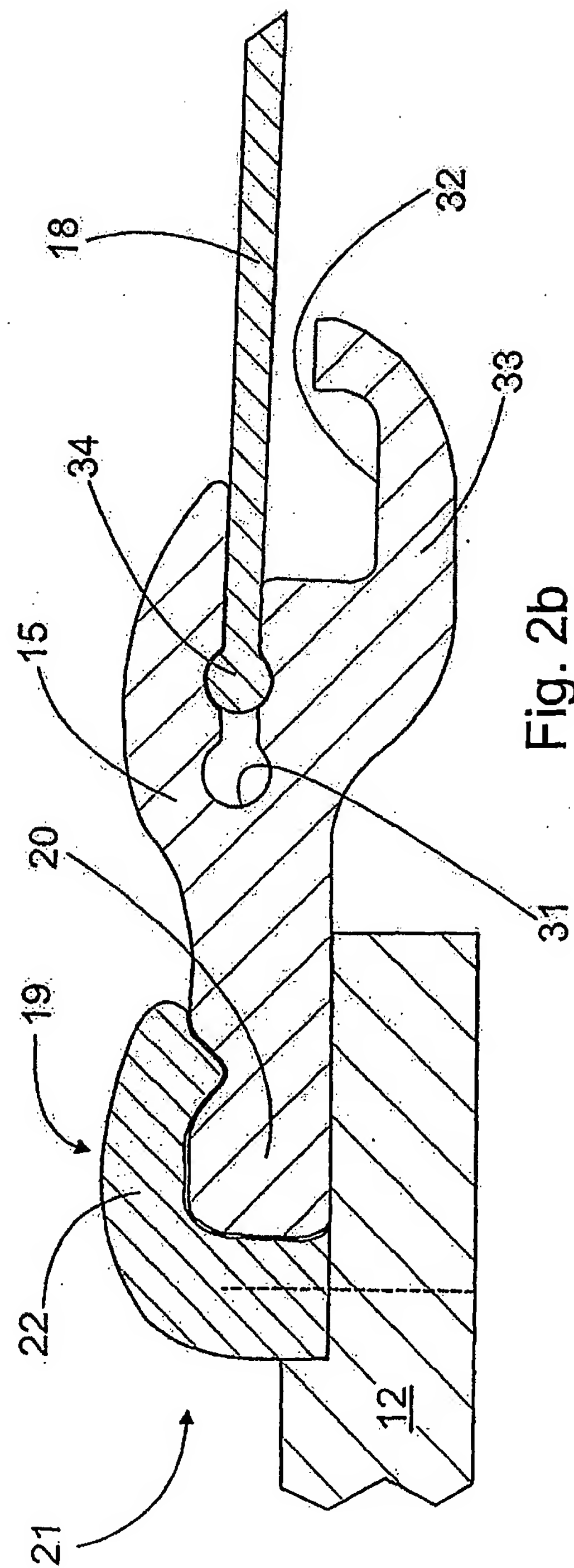
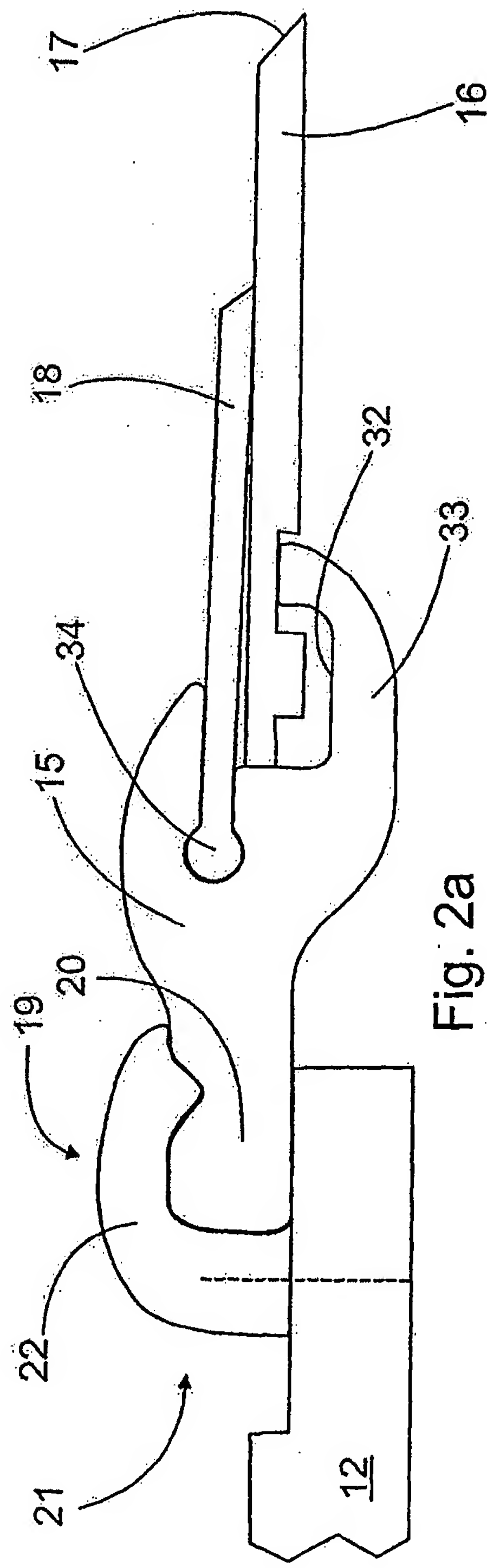
The above-described construction also enables a quick adjustment of the treatment equipment. Various types of blade holders can be attached to the frame and similarly, various types of blades and backing blades can be quickly replaced in the blade holders. In this way it is possible to obtain a suitable combination for each situation by changing the components. Due to the removable backing blade, the blade holder can additionally be entirely cleaned. This is easy also on the outside of the machine, as the whole blade holder can be simply removed from the machine.

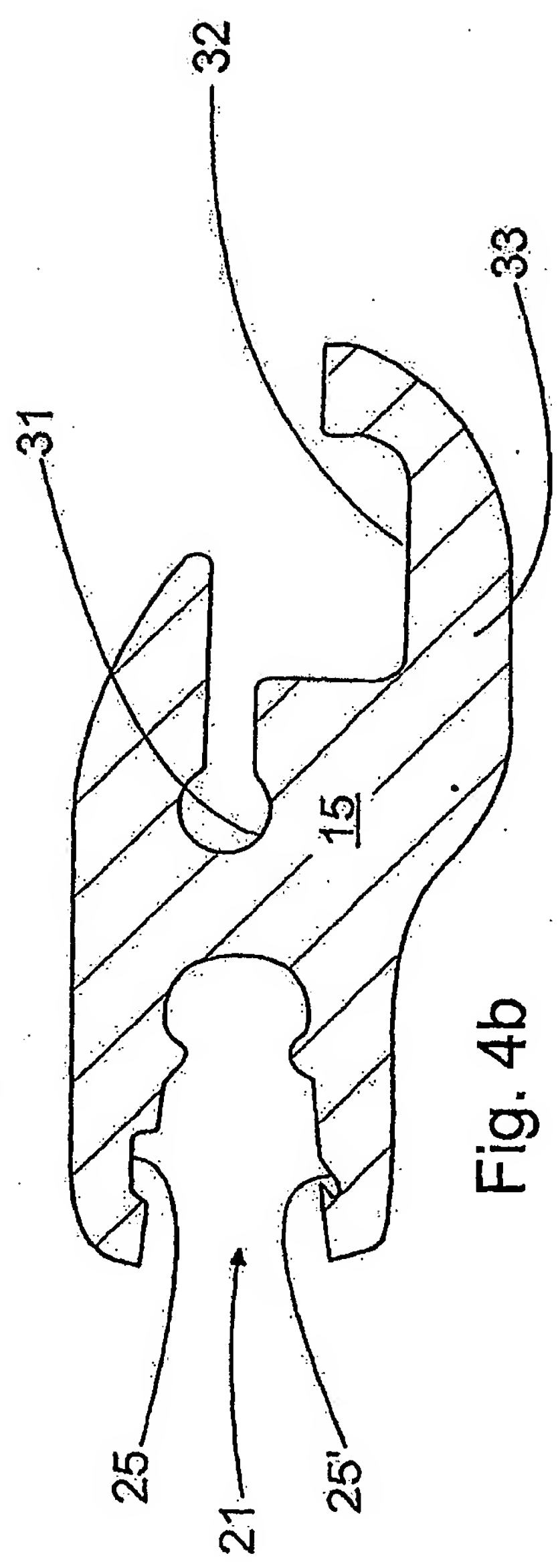
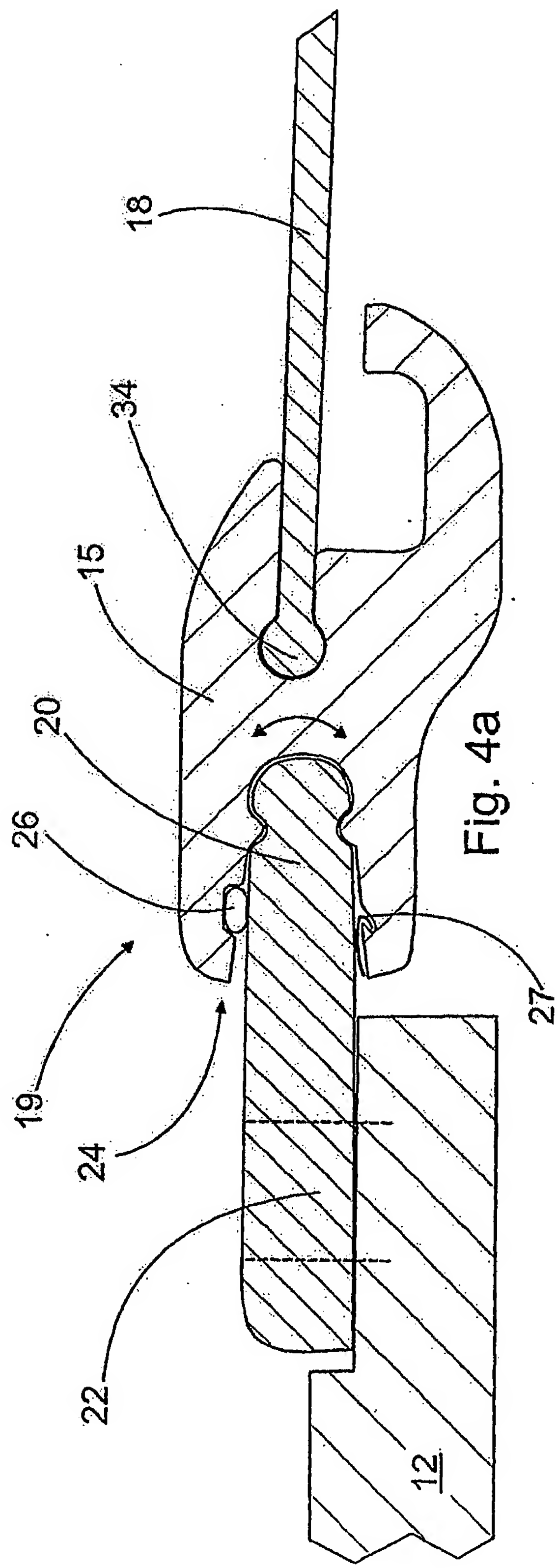
Composite-construction treatment equipment is advantageous as regards the operation as well. Firstly, for example the tested blade holders weigh only 3 kg/m, in which case bending due to their own weight is nonexistent. In addition, the blade holder can be installed in the treatment equipment manually without cranes or other supports. Furthermore, the composite-construction endures well sudden impacts and returns to the original shape in spite of even major deformations. On the other hand, when damaging, the composite-construction breaks totally at once functioning thus as a special safety fuse. In case of damage to the blade holder, it can be quickly replaced with a new one without a lengthy unoperative state of the treatment equipment. Damaging also saves other constructions of the treatment equipment. The operation of the treatment equipment can also be easily monitored by installing diaphragm sensors,

CLAIMS

1. Composite-construction treatment equipment, which is designed to be set in connection with a moving surface (10),
5 the equipment comprising
- a frame (12) arranged in the vicinity of the said surface (10),
 - a blade holder (15) formed of a composite material to form an essentially integral component, which is connected to the
10 frame (12),
 - a blade (16) adapted to the blade holder (15), including an edge (17) arranged to be set in contact with the moving surface (10) by moving the blade holder (15), and
 - a separate backing blade (18) adapted to the blade holder
15 (15), set to the blade holder (15) by one end while the other end extends closer to the said edge (17) than the blade holder (15),
- characterized in that the blade holder (15) is removably adapted to the frame (12) with a pair of form-lockable counter
20 clamps (19), in which the form-lock is arranged tight in the lateral direction of the blade (16) and essentially free in the longitudinal direction of the blade (16).
2. Treatment equipment according to claim 1, characterized in
25 that the first counter clamp (20) forming the pair of counter clamps (19) is a profiled shoulder, which is adapted to be covered essentially on the opposite sides by the second counter clamp (21).
- 30 3. Treatment equipment according to claim 1 or 2, characterized in that in the blade holder (15) the counter clamp (20, 21) is arranged in the rear part parallel to the blade holder (15) with the blade (16) attached to the front part of the blade holder (15).

11. Treatment equipment according to claim 10, characterized in that the blade holder (15) has at least two fastening points (31) for the detent (34) for adjusting the position of the backing blade (18) in the lateral direction of the blade (16).





INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 2004/050006

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21G 3/00, D21H 23/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: D21G, D21H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	FI 111474 B (METSO PAPER, INC.), 31 July 2003 (31.07.2003), abstract --	1-11
A	RU 538081 A (E.M. GOLOWKO), 5 December 1976 (05.12.1976), figure 1, abstract --	1-11
A	WO 0046445 A1 (VALMET CORPORATION), 10 August 2000 (10.08.2000), abstract --	1-11
A	US 4367120 A (JOHN M. HENDRIKZ), 4 January 1983 (04.01.1983), abstract --	1-11

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

10 May 2004

Date of mailing of the international search report

25 -05- 2004

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Nils Nordin/Els
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

31/03/2004

International application No.

PCT/FI 2004/050006

FI	111474	B	31/07/2003	FI	20015048	D	00/00/0000
RU	538081	A	05/12/1976	NONE			
WO	0046445	A1	10/08/2000	AT	231819	T	15/02/2003
				AU	2443400	A	25/08/2000
				AU	4299300	A	17/11/2000
				CA	2361625	A	10/08/2000
				DE	60001314	D	00/00/0000
				EE	200100554	A	16/12/2002
				EP	1181231	A,B	27/02/2002
				SE	1181231	T3	
				EP	1196657	A	17/04/2002
				FI	4106	U	31/08/1999
				FI	105577	B	00/00/0000
				FI	990196	D,V	29/04/1999
				JP	2002536559	T	29/10/2002
				NO	20015282	A	29/10/2001
				US	6447646	B	10/09/2002
				WO	0066478	A	09/11/2000
US	4367120	A	04/01/1983	NONE			
EP	1123751	A1	16/08/2001	CA	2332273	A	08/08/2001
				CN	1308161	A	15/08/2001
				FI	4615	U	11/09/2000
				FI	20000254	D,V	16/06/2000
				JP	2001254297	A	21/09/2001
				US	2001011401	A	09/08/2001

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☒ **BLACK BORDERS**
- ☒ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☒ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☒ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.